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World Reporting Service on Plant Diseases and Pests

Insect Pests of Coconut Palm in India

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With about 1.58 million acres under coconut, India has the second largest coconut producing area in the world, yielding about 4,131 million nuts annually. Yet the production falls short of the requirement by about 30 percent. One of the main causes for this deficiency is the serious damage inflicted by insect pests.

Although a number of coconut pests have been recorded in India, only some species materially affect and offset the yield of coconut. The present notes summarize briefly the results of investigations on those species which are of economic importance.

Rhinoceros Beetle

The rhinoceros beetle, *Oryctes rhinoceros* L., is an ubiquitous pest of coconut palm in India, and it also attacks the palmyra palm (*Borassus flabellifer*), and some other palms (6). The adult beetle bores into the crown of the palm, cutting and chewing the tender foliage and damaging the young inflorescence while still enclosed in the spathe. Sometimes it may cause the death of the palm by destroying the growing point. It is estimated that the beetle causes a loss of 5 to 10 percent of the annual coconut production in India.

The beetle breeds in all types of decaying organic matter, such as the cattle manure, the communal refuse heaps, decaying vegetable matter, and the dying and dead trunks of coconut and other palms. The duration of the life cycle, from the egg to the emergence of the adult, is about six months on the west coast of India.

The pest is not recorded in India as being attacked by any insect parasites. However, a number of animals have been found to feed on it at various stages: rats, pigs, squirrels, chickens, ducks, owls, crows, lizards, toads, Carabid beetles, Histerid beetles, Elaterid beetles and centipedes. *Scolia oryctophaga* Coq., which has given satisfactory control of *Oryctes tarandus* Ol. in Mauritius, was recently imported into India from Madagascar for trials against the rhinoceros beetle.

The larvae, pupae and adults of the rhinoceros beetle are attacked by the green muscardine fungus, *Metarrhizium anisopliae* (Metch.) Sor. The fungus is more active during the southwest monsoon on the west coast, when it takes a fair toll of the pest (17). Recent investigations (10) have shown that during favorable periods the epizootics may be initiated by artificial dissemination of *M. anisopliae* var. *rhinoceros*. In chemical control trials it was found that the pest could be successfully controlled by treatment of breeding places with 0.01 percent BHC (13 percent gamma isomer) (12). Application of 5 percent BHC and sawdust in the leaf axils, was also found useful for the control of adults during dry weather. Baits placed in coconut gardens, consisting of attractive materials and 0.1 percent BHC are effective in attracting and killing adult beetles (6).

Coconut Caterpillar

The coconut caterpillar, *Nephantis serinopa* Meyr., is another serious pest of the coconut palms growing in coastal and littoral tracts of India, Ceylon and Burma. Its larvae live on the undersurface of leaves in galleries made of silk and excreted matter and feed on the green tissues. The injury inflicted by numerous larvae causes the fo-

liage to wither and when many fronds on a tree are similarly affected, the reduction in yield is considerable.

The principal food plant of this pest is the coconut palm, but it also attacks the palmyra and several other palms (7).

On the west coast of India, the insect is present throughout the year on coconut in some stages of development, but its activity becomes significantly apparent during the dry months of March, April and May. On the east coast the period of maximum activity extends from March to June.

The life cycle from egg laying to adult emergence varies from 42 to 76 days with a mean duration of 57 days. The adults live for about five days and do not feed, during which period each female lays 137 eggs in average (7).

The insect is subject to the attack of some natural enemies. Among the more important ones, *Apanteles taragamae* Vier., *Microbracon brevicornis* Wesm., *Perisierola nephantidis* Mues. and *Elasmus nephantidis* Roh. attack the larvae; *Trichospilus pupivora* Ferr., *Stomatoceros sulscutellum* Gir., *Brachymeria nephantidis* Gahan., *Xanthopimpla punctata* F. and *Goryphus* sp., parasitize pupae; and the mite *Pyemotes ventricosus* Newport attacks both eggs and pupae. The other predators are *Parena laticincta* Bates., *Phlaeodromius nigrolinea* Chaud. and *Sphedanolestes aurescence* Dist.

Microbracon brevicornis, Perisierola nephantidis, Elasmus nephantidis and *Trichospilus pupivora* have been bred in large numbers and released in *Nephantis* infested areas for the control of the pest.

Successful chemical control of the pest has been obtained by spraying the palms with 0.2 percent DDT (11). In dry areas 0.2 percent BHC spray also gave satisfactory results, but in areas of heavy rainfall, it was found to loose its residual toxicity very soon (7).

Palm Weevil

The palm weevil, *Rhynchophorus ferrugineus* Ol., is the most destructive pest of young coconut palms throughout India. Unlike the rhinoceros beetle, the adult weevil is incapable of causing any direct damage to the tree, but the early stages of the insect are passed on the palm and the damage caused by the larvae is often fatal to the tree. It is very difficult to detect the presence of the infestation in early stages of attack, but sometimes a few small holes may be seen in the infested area, from which pieces of chewed fibers protrude and a thick brownish liquid oozes out. It is estimated that 5 percent of young coconut palms below the age of ten years are killed by this pest every year in Kerala.

Copeland (2), Hutson (4) and Ayyar (1) believed that the weevil would not lay its eggs in sound trees, but only in those where the soft tissues had already been exposed. Nirula (8) recorded that in young palms up to about seven years of age the females could infest the sound palms by laying eggs in the tender tissues of the crown. The life cycle, which is passed inside the palm, is completed in about 81 days on the west coast of India.

No parasite has been recorded attacking this pest in India, excepting a mite belonging to the family Pyemotidae, which is an external parasite on the pupae and adults of the weevil (8).

Several insecticides were tried for the control of this pest (14), and a combination of 1 percent pyrethrin and 10 percent piperonyl butoxide, diluted to 1 percent in water, was found to give the best result. A young palm below the age of ten would require about 1,000 c.c. to 1,500 c.c. injected into affected portions of the palm through a funnel. As a prophylactic measure, application of 5 percent BHC or chlordane in mixture with sand, in leaf axils was found satisfactory.

Cockchafer

The cockchafer *Leucopholis coneophora* Burm. is a serious pest of coconuts in some parts of Kerala. The larvae feed on roots of the coconut palm, causing the leaves to turn pale yellow. The infestation results in a great reduction in nut production. Besides coconut palm, the pest attacks inter-cultivated crops such as tapioca, sweet potato, *Colocasia*, yam, plantain, etc.

This insect was first recorded as a coconut pest in 1951 (13), and has been found only in India. During its annual life cycle, the adults emerge *en masse* from the soil in about two weeks after the commencement of

the southwest monsoon, and remain active for about eight weeks. Eggs are laid in the soil in June and July, which hatch in about 20 days. The larvae feed till April or early May, after which they pupate in the earthen cocoons.

Birds are the most important predators of larvae of this pest and are extremely active when the soil in the infested areas is plowed up. The striped squirrel, rats, cats and dogs are also found preying upon the pest.

Tillage and deep plowing of the soil at the time when the pest is abundant have been suggested as measures of control (9). The application of 5 percent chlordane at the rate of 28 pounds per acre was also found to give good results.

Other Insects

Contheyla rotunda H. This leaf-eating slug caterpillar is a pest of sporadic occurrence, but at times it is capable of causing considerable damage. During severe outbreaks, its larvae completely defoliate the palms, causing heavy yield reduction, and sometimes spathes and nuts are also attacked. The pest is common only on the west coast of India. The time which is required to complete its life cycle varies from 40 to 68 days with an average of 52 days (16).

The larvae of this pest is parasitized by *Rogas* sp., and the pupae by *Antrocephalus* sp. and *Chrysis* sp. Successful control was obtained by spraying the foliage with 0.1 percent DDT (16).

Macroplectra nararia Moore. On the east coast of India, the spiny slug *Macroplectra nararia* occasionally attacks coconut palms and may cause extensive damage. It has recently assumed major proportions in the east and west Godavari districts of Andhra Pradesh.

According to Dharamraju (3), the pest is attacked by a Braconid in its larval stage, by a Chrysidid and two different species of Chalcids in its pupal stage. The pest was brought under control by spraying coconut leaves with 0.2 percent DDT.

Parasa lepida Cram. This is another Limacodid which infests young coconut palms. It is present in coconut plantations all the year round on the west coast, but severe infestations occur only sporadically. The larvae feed on leaves leaving behind only midribs.

The larvae are heavily parasitized by *Clinocentrus* sp., *Stomatoceros ayyari* G., and *Eurytoma parasae* G.

The pest can be controlled by mechanical destruction of larvae and pupae. Recently dusting with 5 percent BHC has given satisfactory control.

Gangara thyrsis Moore. This is a Hesperid butterfly, the caterpillars of which attack young coconut seedlings one to two years old. It is very common throughout the west coast of India and at times causes considerable damage. Its life cycle is completed in about seven weeks.

The pest is subjected to attacks of a number of parasites and predators, which keep its population under control. Hand picking of the caterpillars and pupae and spraying with 0.2 percent DDT, are suggested as control measures.

Suastus gremius Fb. This is another Hesperid butterfly, the larvae of which feed on various palms like coconut, palmyra, date, etc. It is generally a minor pest, but likely to cause considerable damage.

For control, hand collection of larvae and pupae in case of minor attack, and spraying with 0.2 percent DDT in case of widespread infestation, are suggested.

Cyclodes omma V. de H. The caterpillars of this Noctuid moth, bore into tender nuts and feed on the contents, causing the nuts to drop. The insect is not very commonly observed on the west coast of India, but whenever it occurs, it causes considerable damage. It possesses the potentiality of becoming a very serious pest.

Betrachedra arenosella Walk. This is a Tineid moth, commonly known as lesser spike moth. The larvae are generally found gnawing the male and female flowers of coconut palm, and the injured female flowers frequently turn distinctly black.

Diocalandra stigmaticollis Gyll. This small, dark, tan-colored weevil, in both adult and

the larval stages, tunnels leaf petioles and flower stalks of coconut palms. Recently, the weevil has been found in very large numbers in Kumarakom (Kerala) on coconut palms affected by stem bleeding disease. The actual role of the insect is under investigation.

Aspidiotus destructor Sign. This widely distributed Coccid, known as coconut scale, feeds on a wide range of plants and is especially destructive to coconut and plantain. It feeds mainly on coconut leaves and during heavy infestations, the leaves may become encrusted with the scales, turn yellow and die. The pest has spread throughout the coconut-growing areas of India and is more common during the dry weather.

Aspidiotus destructor is attacked by a number of parasites and predators; of these the predatory Coccinellid beetles are very important. Lime sulphur spray has been used for a long time for the control of this pest, but recently spraying with 0.025 percent parathion has given good results.

Stephanitis typicus Dist. This is a small Tingid bug, which is often found on tender leaves of coconut palm. By sucking the sap of leaves the insect causes rather negligible damage to the host, but recently Naragaj and Menon (5) suggested that it may be responsible for the spread of disease or wilt of coconut palm which is probably of virus origin.

Oecophylla smaragdina F. This red ant occurs throughout the plains of the Indo-Australian region. It builds its nests in the folds of coconut leaves, usually on trees infested by Coccids, as the ant lives to a large extent upon the honey-like exudation of the scales.

Recently, *Oecophylla* was observed in parts of Kottayam district (Kerala) causing heavy damage to palms by colonizing *Pseudococcus* sp. on inflorescences. The infestation of the scales results in nutfall and considerable yield reduction.

The radical control of this ant consists in the destruction of the nests by burning them with torches during the night. Recently, spraying with chlordane, aldrin and parathion has been reported to give good results.

Odontotermes obesus Ramb. The termite is a serious pest of coconut seedlings in laterite areas. The seedlings may be attacked either through the base of the seednut or at the collar portion. The wilting of the central shoot is usually the first visible symptom, which is often followed by the death of the seedling. It was reported (15) that about 20 percent of the coconut seedlings in nurseries situated in laterite areas were destroyed by termite attacks.

Soil application of 10 percent BHC dust in coconut nurseries before the sowing of seednuts, at a rate of 100 lb. per acre, keeps the seedlings free from termite attack. Some new insecticides were tested recently against the workers of *Odontotermes obesus* and parathion, pentachlorophenol, sodium pentachlorophenate and chlordane were found to be very effective (15).

Literature Cited

1. Ayyar, T.V.T. 1940. *Handbook of Economic Entomology for South India.* Govt. Press, Madras, India.
2. Copeland, E.B. 1914. *The Coconut.* Macmillan & Co., London.
3. Dharamraju, E. 1952. The biological control of the blackheaded caterpillar *Nephantis serinopa* Meyr., in the East Godavari district of Madras State. *Indian Coconut Jour. 5*: 171-176.
4. Hutson, J.C. 1933. *The Red Weevil of Coconut.* Ceylon Dept. Agr. Leaflet 22 (Revised).
5. Nagaraj, A.N. and K.P.V. Menon. 1956. Note on the etiology of the wilt (root) disease of coconut palms in Travancore-Cochin. *Indian Coconut Jour. 9* : 161-165.
6. Nirula, K.K. 1955. Investigations on the pests of coconut palm. Part II. *Oryctes rhinoceros* L. *Indian Coconut Jour. 8* : 161-180; *9* : 30-79.
7. —. 1956. Investigations on the pests of coconut palm. Part III. *Nephantis serinopa* Meyrick. *Indian Coconut Jour. 9* : 101-131, 174-199.

8. NIRULA, K.K. 1956. Investigations on the pests of coconut palm. Part IV. *Rhynchophorus ferrugineus* Ol. *Indian Coconut Jour.* (In printing).
9. —. 1956. Investigations on the pests of coconut palm. Part V. *Leucopholis coneophora* Burm. *Indian Coconut Jour.* (In printing).
10. —. 1957. The possibilities of utilising the green muscardine disease for the biological control of *Oryctes rhinoceros* L. *Indian Coconut Jour.* (In printing).
11. NIRULA, K.K., J. ANTONY and K.P.V. MENON. 1951. Investigations on the pests of the coconut palm. *Nephantis serinopa* Meyr. Life history, habits and control with DDT spray. *Indian Coconut Jour. 4* : 217-234.
12. —. 1951. Investigations on the pests of the coconut palm. (2) Comparative studies with different insecticides in relation to the control of the grubs of the rhinoceros beetle (*Oryctes rhinoceros* L.). *Indian Coconut Jour. 4* : 49-56.
13. NIRULA, K.K., J. ANTONY and K.P.V. MENON. 1952. A new pest of coconut palm in India. *Indian Coconut Jour. 5* : 137-140
14. — 1953. The red palm weevil and its control. *Proc. Indian Sci. Cong. 40.* 147-148.
15. —. 1953. Some investigations on the control of termites. *Indian Coconut Jour. 7* : 26-34.
16. NIRULA, K.K., J. Antony, K.N. SAHASRANAMAN and K.P.V. MENON. 1954. Observations on the biology and control of *Contheyla rotunda* H. *Indian Coconut Jour. 7* : 143-155.
17. NIRULA, K.K., K. RADHA and K.P.V. MENON. 1955. The green muscardine disease of *Oryctes rhinoceros* L. I. Symptomatology, epizootology and economic importance. *Indian Coconut Jour. 9* : 3-10.

Correlation between Low Temperature and Incidence of *Phytophthora* Pod Rot of Cacao in Ceylon

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THE control of black pod rot caused by *Phytophthora palmivora* var. *theobromae*[2, 3] is of great importance in maintaining the economic production of cacao in most of the growing areas of the world. Chemical and sanitary practices are not always enough to curtail the losses but chemical control could be rendered more effective if disease outbreaks could be forecast with a certain degree of accuracy and fungicides applied at an appropriate period of the disease development.

The high periods of disease incidence are not easily determined and, even if they are observed, the climatic factors involved are generally unknown. A study of the effects of climatic factors would therefore provide a basis for predicting disease outbreaks and for determining the right time for application of fungicides.

Studies on the epidemiology of black pod rot and its relationship with weather have been undertaken in a few instances. In Bahia, Brazil, a correlation between the incidence of the disease and the minimum air temperature was found by Lellis.[4]

This paper presents the results of a statistical study on correlations between weather factors, including rainfall, minimum and maximum temperatures, diurnal and nocturnal relative humidities, and pod rot incidence for the period from July 1952 to June 1955. The study was made on the basis of records taken at the Pallekelly Estates, Kandy, except the records of minimum temperatures for the area, which were obtained from official sources.

[1] The authors are grateful to Mr. David Currie, Superintendent of Pallekelly Estates, Kandy, for furnishing the data used in this study and to Mr. A.L. Gunasekera, Division of Plant Pathology, Department of Agriculture of Ceylon, for his assistance in this investigation.

[2] ORELLANA, R.G. 1953. Consideration of principles of fungicidal action for the control of black pod rot of cacao in Costa Rica. *Cacao* 2 (43-44) : 1-2.

[3] ORELLANA, R.G. 1956. Estado de las investigaciones sobre la enfermedad del cacao causada por *Phytophthora*. *Proc. Inter-American Cacao Conf.* 6 : 15.

[4] LELLIS, W.T. 1952. Temperaturas como factor limitante da podridão parda dos frutos do cacaueiro. *Bol. Tec. Inst. Cacau da Bahia*, Brasil. 6 pp.

TABLE 1. *Correlation coefficients between various weather factors and incidence of black pod rot of cacao at Pallekelly Estates, Kandy, from July 1952 to June 1955.*

Factor	Rainfall	Minimum temperature	Maximum temperature	Diurnal relative humidity	Nocturnal relative humidity
Incidence of pod rot . . .	— 0.034	— 0.306	+ 0.128	— 0.194	— 0.053
Rainfall		+ 0.130	— 0.218	+ 0.534 **	+ 0.191
Minimum temperature . .			— 0.127	+ 0.530 **	— 0.033
Maximum temperature . .				— 0.574 **	+ 0.385 *
Diurnal relative humidity .					+ 0.351 *

* significant at 5 percent level of significance.

** significant at 1 percent level of significance.

Statistical Studies

Although the data represent a time series, the small number of observations did not warrant a time series study, and simple statistical methods were therefore applied to highlight broad, general features presented by the data.

Correlation coefficients between four weather factors and the incidence of pod rot as expressed in percentage of infected pods are given in Table 1. It is obvious that none of these factors are significantly correlated. The intercorrelations between the weather factors, interesting as they are in their own right, were not made the subject of the present study.

Contrary to general expectations, rainfall has very little effect on the disease incidence. The highest correlation of these factors on the incidence of pod rot exists between minimum temperature and disease but the correlation coefficient obtained still fails to reach the 5 percent level of significance.

The correlation between rainfall and incidence of pod rot was further studied by calculating lag correlation coefficients, the pod rot incidence being taken at lags of one, two. . ., six months after the month when rainfall records were taken. The results, presented in Table 2,

TABLE 2. *Correlation coefficients between rainfall and incidence of pod rot with different lengths of lag periods at Pallekelly Estates, Kandy.*

Length of lag period between rainfall recording and disease recording	Correlation coefficient
1 month	+ 0.159
2 months	+ 0.159
3 months	+ 0.177
4 months	— 0.166
5 months	+ 0.028
6 months	— 0.128

do not reveal a significant correlation nor any definite trend.

As shown by the correlation coefficients in Table 3, there is also no significant lag correlation between diurnal relative humidity and pod rot incidence.

TABLE 3. *Correlation coefficients between diurnal relative humidity and incidence of pod rot with different lengths of lag periods at Pallekelly Estates, Kandy.*

Length of lag period between humidity recording and disease recording	Correlation coefficient
1 month	— 0.154
2 months	+ 0.121
3 months	+ 0.181

Statistical study on the correlation between minimum temperature and pod rot incidence, on the other hand, shows that a correlation significant at 1 percent level exists between these two factors with a lag period of one month. A highly significant negative correlation between the minimum temperature of the previous month and the pod rot incidence of the current month is thus established. The correlation coefficient between the two factors with a lag of two months is also significant, but only at 5 percent level, whereas a lag of three months yields no significant correlation. The results are shown in Table 4.

The relation between the minimum temperature and the pod rot incidence with a

TABLE 4. *Correlation coefficients between minimum temperature and incidence of pod rot with different lengths of lag periods at Pallekelly Estates, Kandy.*

Length of lag period between temperature recording and disease recording	Correlation coefficient
1 month	— 0.472**
2 months	— 0.376*
3 months	+ 0.143

* significant at 5 percent level of significance.
** significant at 1 percent level of significance.

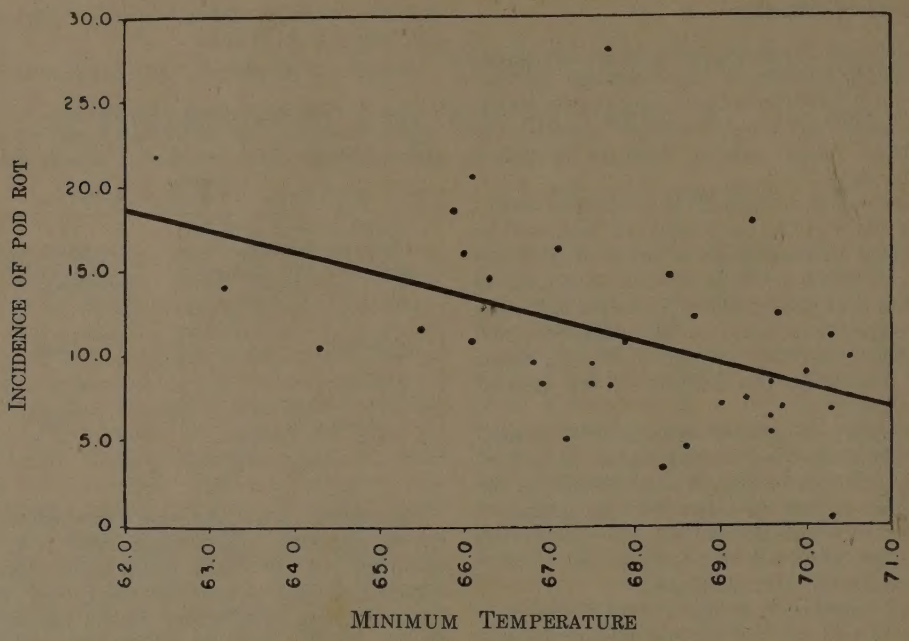

Figure 1. Correlation between minimum temperature (°F.) and incidence of black pod rot of cacao in percentage.

TABLE 5. *Estimated incidence of pod rot with lag of one month for different minimum temperatures.*

Minimum temperature °F.	Estimated percentage of pod rot one month after temperature recording
62	18.72
63	17.42
64	16.11
65	14.80
66	13.49
67	12.18
68	10.88
69	9.57
70	8.26
71	6.95

lag period of one month may be represented by the following equation:

$$Y = 99.82 - 1.308\ x$$

where x stands for minimum temperature and Y for the corresponding estimated pod rot incidence. The estimated values of pod rot for different minimum temperatures are indicated in Table 5 and also in Figure 1.

It was unfortunate that similar disease data from other cacao-growing areas in Ceylon were not available for study. It is hoped, however, that this study will initiate detailed investigations to better the understanding on the relationship between disease incidence and weather factors. The findings thus obtained would be of practical value for timing fungicidal application to the patterns discovered.

Plant Diseases in British Colonial Dependencies [1]

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West Indies

Growers in Trinidad and Jamaica are using low volume oil-based sprays for the control of banana leaf spot (*Mycosphaerella musicola*) with great success. Mist-blowing with oil alone has also markedly checked the development of the disease.

Grapefruit melanose spotting (*Diaporthe citri*) is widespread and causes serious reductions in the amount of shippable fruit.

Two fungi have been found in association with an unusual spotting of grapefruit at an estate in the Lopinot Valley, Trinidad, one producing a *Mycosphaerella* perfect stage, while the other may be *Guignardia citricarpa*.

Nigeria

Imported maize varieties resistant to *Puccinia polysora* were seriously affected by a suspected new virus disease similar to the " virus leaf fleck " of Stoner [2] in the United States.

A serious wilt disease of seedling cacao is caused by *Phytophthora palmivora*. Effective control was achieved by 0.3 to 0.5 percent perenox sprays applied at three-day intervals from germination until six weeks of age.

Yams (*Dioscorea* sp.) on Moor Plantation were attacked by a suspected virus disease, white yams being more susceptible than yellow or water yams.

Fomes noxius and *Macrophomina phaseoli* have been isolated from one-year-old citrus seedlings.

A leaf spot of young *Hevea* rubber trees has been provisionally identified as *Helminthosporium heveae*.

Cotton bacterial blight (*Xanthomonas malvacearum*) was reduced by seed dressings with agrosan GN.

Malaya

Several clones of *Hevea* rubber resistant to *Dothidella ulei* have been successfully established after intermediate quarantine at Kew, England.

Aden

The " Abyan root rot " of cotton is under investigation. So far the cause is undetermined, but it is possible that a species of *Rhizoctonia* is implicated.

Sarawak

A species of *Phytophthora*, not yet fully determined, has been isolated from foot-rot of pepper (*Piper nigrum*) and research on control measures will continue.

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[1] This report covers the period July 1956 to June 1957.

[2] STONER, W.N. 1953. Leaf fleck, an aphid - borne persistent virus disease of maize. *Phytopath. 43* : 683-689.

Outbreaks and New Records

Canada

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THE following records of occurrence or establishment of insects new to Canada were made in 1954 and in all cases the records were believed to be new to North America as well. In many instances the insects were described as new species.

Aphid on Black Raspberry

The aphid *Amphorophora rubitoxica* Knowlton caused widespread chlorotic spotting of the foliage of Munger black raspberry (*Rubus occidentalis*) in the coastal regions of British Columbia. Spotting appears first in June and by mid-July virtually all plants are affected, although on some only a few leaves may be spotted.

A Pest of Apple and Hawthorn

An yponomeutid, *Swammerdamia lutarea* (Haw.), caused extensive damage to hawthorn in St. John's, Newfoundland. In Europe, it attacks apple as well as hawthorn.

Geometrid on Cherry

A geometrid, *Calocalpe prunivorata* Ferguson, was taken on wild black cherry (*Prunus serotina*) in Nova Scotia and southern areas of Quebec and Ontario. The larvae were found always in large nests formed by tying the leaves on terminal shoots together. Although the species has two overlapping broods each season in the southern part of its range in North America, there is probably only one brood in most or all of its range in Canada.

Ermine Moth on *Euonymus*

Larvae of *Yponomeuta padella* L., commonly called the ermine moth, were collected on *Euonymus* sp. in mid-June in a nursery at Agincourt, Ontario. Later, approximately 50 cocoons were found in the area. In Europe, this insect feeds only on species of *Euonymus*.

Barberry Geometrid

The eastern North American subspecies of the barberry geometrid, *Coryphista meadi atlantica* Munroe, was described from specimens collected in Kings County, Nova Scotia, in 1951 and at Ottawa, Ontario, in 1952. It occurs sporadically in Eastern Canada and commonly in the United States. In 1952, an outbreak in the Ottawa region caused minor damage to ornamental barberry. The western subspecies, *Coryphista meadi meadi* (Packard), occurs commonly in southern British Columbia and the Cordilleran region of Alberta.

Mite on Pine

A mite, *Typhlodromus pini* Chant, was described from specimens collected from beneath the bark of lodgepole pine (*Pinus contorta*) and white pine (*P. strobus*) in Vancouver, British Columbia.

Federation of Rhodesia and Nyasaland

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Insect Pests of Cereals

Severe damage to maize crops, mainly in the Hartley District of Southern Rhodesia, was caused by *Epilachna similis* Thb. This has previously been regarded as a minor pest only.

In the course of investigations on grain storage, two previously unrecorded species of *Carpophilus*, *C. hemipterus* L. and *C. dimidiatus* F., were found in small numbers at Shamva.

Root-Knot Nematodes

A survey of the root-knot eelworms of the Federation is being made. Four species have been detected so far: *Meloidogyne javanica* (Treub) is widespread and probably indigenous, *M. hapla* Chitwood is of fairly frequent occurrence in market gardens and other irrigated areas, *M. incognita* (Kofoid and White) var. *acrita* Chitwood and *M. arenaria* (Neal) are of less frequent occurrence, the former being the only species other than *M. javanica* which has been found as a field infestation in nonirrigated land. The first three have been found in Northern Rhodesia as well as Southern Rhodesia, but so far only *M. javanica* is known from Nyasaland.

Israel [1]

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Occurrence of *Claviceps purpurea* on Wheat and Rye

Sclerotial stage of *Claviceps purpurea* (Fr.) Tul. was found and determined for the first time in Israel in June 1956 on rye in Mikve-Israel on the coastal plain. Only a few plants were then found affected.

An outbreak of the disease on durum wheat was observed for the first time in June 1957. This new epidemic appearance in Israel seems to be due to the very unusual climatic conditions prevailing in 1957: a very humid spring with late rains after several frosty nights during the previous winter.

The disease was found in several fields of durum wheat in humid regions of the country. Sclerotia were found in local varieties, Noursi and Zenati-Bouteille, one to five on each ear. Most of them were of the size and shape of the host grain; their color was gray-violet.

The heavy infection on the two durum wheat varieties mentioned above may be explained by their tendency to lodge and it is supposed that this characteristic facilitates the primary infection by the parasite. In addition, these varieties are slightly heterogenous as to the time of heading and flowering; this feature may be favorable to the dissemination of the fungus by its conidial spores.

The occurrence of this disease on wheat is of special interest since wheat is not normally known as a common host of *Claviceps purpurea*.

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Spain and Spanish Sahara

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Locust Outbreaks in 1957

After a few years of relative inactivity, the Moroccan locust (*Dociostaurus maroccanus* Thunb.) appeared in 1957 in its gregarious phase in the Provinces of Extremadura (Cáceres and Badajoz), La Mancha (Ciudad Real) and Andalucía (Cordoba and Jaén). The survey made in the winter of 1956-57 revealed high density of egg masses in over 21,000 hectares. Control operations were carried out successfully by farmers and organizations under the technical supervision of the Department of Agriculture. Materials used included 775 tons of 20 percent BHC dust applied from the ground and from the air, and 80 tons of arsenicals mixed with 1,500 tons of bran applied as bait.

The territory of Ifni of Spanish Sahara in West Africa was also invaded by the desert locust (*Schistocerca gregaria*) and satisfactory control was obtained with BHC dust. Although this locust is of no economic importance in this territory, the campaign was undertaken as a measure of co-operation with anti-locust campaigns of other countries in the region.

Plant quarantine announcements

Union of Soviet Socialist Republics

Quarantine regulations for the importation of plant products into the U.S.S.R. were issued on 9 January 1956 by the State Directorate for Quarantine and Plant Protection of the Ministry of Agriculture of the U.S.S.R. They are based on Resolution No. 3786 of 6 October 1948 of the Council of Ministers of the U.S.S.R. and the Decree of the Ministry of Agriculture No. 1551 of 6 October 1948 on quarantine for foreign plant material and the Decree No. 1827 of 22 December 1948 on quarantine fumigation of plant material.

General Regulations

These quarantine measures aim to prevent the introduction of pests, diseases and weeds that do not occur or have only a limited distribution in the territories of the U.S.S.R. The Ministry of Agriculture published a list of these pests as an integral part of this Regulation.

To prevent the introduction of pests, diseases and weeds the Ministry of Agriculture has established, in agreement with other Ministries, a network of quarantine stations at sea and river ports, airports and frontier railway stations. Special instructions have been issued by the Ministry of Agriculture of the U.S.S.R. for the inspection of plant material introduced into the U.S.S.R.

The following materials are subject to quarantine inspection whether imported into or in transit through the U.S.S.R.:

1. Seeds of crops and wild plants.
2. Living plants and parts thereof (seedlings, shoots, roots, tubers, bulbs, etc.,).
3. Cereals for food or feed, fresh fruit, cotton fibers, wool, flax and other fibers, raw tobacco, spices.
4. Packing material of plant origin in which goods are packed for introduction into or transit through the U.S.S.R.
5. Soil samples and living plants with soil attached.
6. Any living cultures of fungi, bacteria, viruses, as well as any living insects.
7. Any insect and plant disease collections, any seed and herbarium material.
8. Any wood with bark.
9. Litter and fodder cereals accompanying imported animals.
10. Consignments and luggage containing material of plant quarantine importance and which are subject to customs inspection according to the regulations of the Foreign Office.

All means of transport, Soviet or foreign, are implicitly subject to quarantine inspection:

1. Aircraft whether or not they carry plant material.
2. Foreign or Soviet ships carrying plant material mentioned above.
3. Railway trains and lorries carrying plant material mentioned above.

Certification and Import Licenses

Plant material may not be imported unless:

a. authorized by the State Inspectorate of Quarantine and Plant Protection of the Ministry of Agriculture;
b. accompanied by a certificate of the country of origin issued by the competent authority stating that the plant material is not contaminated by pests, diseases or weeds of plant quarantine importance. Plant products from countries which do not maintain a quarantine service may be imported only with special authorization from the State Inspectorate of Quarantine and Plant Protection of the Ministry of Agriculture.

Imports Prohibited

Importation or transit of the following plant material is prohibited from areas where specific pests or diseases occur:

1. Cotton and other plants of the family Malvaceae from areas where *Pectinophora gossypiella* occurs.
2. Crop plants from areas where *Pantomorus leucoloma*, *Popillia japonica* or *Phymatotrichum omnivorum* occurs.
3. Potato tubers from areas where *Phthorimaea* (*Gnorimoschema*) *operculella*, *Leptinotarsa decemlineata*, *Heterodera rostochiensis* or *Synchytrium endobioticum* occurs.
4. Propagating material of citrus and other plants from areas where *Xanthomonas citri*, *Chrysomphalus ficus* or tristeza (quick decline) occurs.

5. Propagating material of pear trees from areas where *Numonia pirivorella* occurs.
6. Propagating material of peach and plum trees from regions where *Laspeyresia molesta* occurs.
7. Flax seed from areas where *Septoria linicola* occurs.
8. Propagating material of trees including fruit trees from areas where *Pseudaulacaspis pentagona* occurs.
9. Grape vine plants from areas where *Phylloxera vastatrix* occurs.
10. Propagating material of stone fruit trees from regions infested with such virus diseases as chlorosis, dwarf-fruit and mosaic of plums.
11. Soil and plants with adhering soil from any country.

In addition, the importation of any seed, crop or ornamental plants, forest trees, agricultural and forest products is prohibited if infected or infested with the pests and diseases enumerated above or originating from areas where they occur.

Samples of seed and propagating material of specially valuable crop and ornamental plants and forest trees may be imported for scientific purposes from areas where these diseases and pests occur if authorized by the Ministry of Agriculture.

Imports Restricted

1. The following plant material may be imported through certain points of entry if fumigated at the quarantine station. The quarantine station at the place of entry will decide upon the use of the plant material. If deemed necessary the imported material will be grown under postentry quarantine:

   a) Propagating material, bud wood and fresh fruit of *Citrus*, pineapples, banana, pomegranate, apricots, apples, pears, plums, grape vine and other fruits; propagating material and bud wood of fig trees, tea, olive trees, bamboo, mulberry trees, laurel, ornamental and other plants which are infected or infested by the following diseases or pests or originate from areas where these diseases and pests occur:

   Grapholitha (Cydia) inopinata
   Carposina sasakii
   Hyphantria cunea
   Ceratitis capitata
   Tetradacus citri (tsuneonis)
   Pseudococcus gahani
   Pseudococcus comstocki
   Pseudococcus citriculus
   Icerya purchasi
   Pulvinaria psidii
   Ceroplastes rusci
   Ceroplastes japonicus
   Ceroplastes rubens
   Ceroplastes floridensis
   Saisetia nigra
   Antonina bambusae
   Leucaspis japonica
   Unaspis (Chionaspis) yanonensis
   Aspidiotus perniciosus
   Aonidiella aurantii
   Dialeurodes citri
   Aleurocanthus spiniferus
   Phyllocoptes oleivorus
   Prays oleellus
   Scirtothrips citri
   Agrilus mali
   Maladera japonica
   Taeniothrips gladioli.

   b) Barley or rice seed infected with the following diseases or originating from areas where these diseases occur:
   Tilletia pancicii
   Ditylenchus angustus
   Aphelenchoides oryzae
   Tilletia (Neovossia) horrida
   Tilletia (Neovossia) indica.

   c) Seed of maize, soybeans, white beans, peas, lentils, groundnuts and other pulses infected or infested with the following diseases or pests or from areas where these pests or diseases occur:
   Callosobruchus (Bruchus) chinensis
   Callosobruchus (Bruchus) quadrimaculatus
   Acanthoscelides obtectus
   Pachymerus (Caryedon) pallidus
   Caulophilus latinasus
   Diplodia zeae
   Pyroderes rileyi
   Bacterium stewarti
   Corynebacterium michiganense

   d) *Citrus* plants and oil plants from areas infected with the following diseases:
   Pseudomonas citriputealis
   Deuterophoma tracheiphila
   Pseudomonas sevastanoi

   e) Fruit trees and soft fruit plants from areas infected with:
   Erwinia amylovora
   Aphelenchoides fragariae
   Sclerotium rolfsii
   Aphelenchoides ribes

In addition, any seed, propagating material of plants, crop plants, agricultural or forest products contaminated with pest or diseases mentioned above or originating from areas where these pests or diseases occur are subject to the same treatment.

2. Seed contaminated with the following weeds may be imported only after cleaning.

Iva axillaris
Solanum carolinense
Ambrosia maritima
Helianthus ciliaris
Helianthus rigidus
Helianthus annuus
Helianthus petiolaris
Cenchrus tribuloides
Striga spp.
Ambrosia psilostachya
Ambrosia artemisiifolia
Ambrosia trifida
Acroptilon picris
Sorghum halepense
Paspalum digitaria
Solanum rostratum
Cuscuta spp.
Commelina communis
Sophora alopecuroides
Sophora pachycarpa (*oroboides*)
Cyperus rotundus
Eriochloa villosa

Seed containing seeds of weeds that are not widespread in the U.S.S.R. must be cleaned until free of these weed seeds before they are used as intended.

If means to clean the seed are not available, the General Quarantine Inspectorate may decide to send them to an area where the ecological conditions exclude the establishment of these weeds.

Agricultural products contaminated with seed or parts of weeds capable of propagation, which are not known to occur in the U.S.S.R., will be retained at the place of entry regardless of quantity or destination.

Agricultural products for food, feed or for processing which are contaminated with seed of weeds which are not widespread in the U.S.S.R. will be processed according to the decisions of the State General Quarantine Station.

News and Notes

France Adheres to International Plant Protection Convention

The Government of France became party to the International Plant Protection Convention on 20 August 1957 when its instrument of adherence was received by the Director-General of FAO. The number of governments contracting to the Convention, including both signatory and adhering members, is thus, at the time of writing, 39, namely: Argentina, Australia, Austria, Belgium, Cambodia, Canada, Ceylon, Chile, Denmark, Dominican Republic, Ecuador, Egypt, El Salvador, Federal Republic of Germany, France, Greece, Guatemala, India, Iraq, Ireland, Israel, Italy, Japan, Korea, Laos, Luxembourg, the Netherlands, New Zealand, Nicaragua, Norway, Pakistan, Republic of the Philippines, Portugal, Spain, Sweden, the Union of South Africa, the Union of Soviet Socialist Republics, the United Kingdom and Yugoslavia.

Coffee Quarantine Discussed in FEDECAME Meeting

The *Federación Cafetalera de América* (FEDECAME) is a federation of coffee-growing countries of the Caribbean, Central and South America concerned with problems of coffee production and marketing.

It held its Tenth General Assembly from 19 to 23 May 1957 in Panama City. This meeting was attended by delegates of the 14 member countries, namely Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Panama, Peru, Puerto Rico and Venezuela, and by observers from Brazil, Colombia, France, Germany, Portugal, Spain, the United Kingdom, the United States and four regional international organizations.

The assembly adopted two resolutions that have a bearing on plant protection.

The first one proposes a uniform plant quarantine regulation for the importation and transit of coffee and coffee-propagating material. The main provisions of these regulations aim at the prevention of the introduction of the coffee berry borer (*Stephanodores hampei*) and coffee rust (*Hemilea vastatrix*) which do not occur at present within the FEDECAME member countries.

The second resolution was adopted to ensure that the coffee-growing countries of Latin America be prepared for any accidental introduction of coffee rust. It resolves that the importation of seed of rust-resistant varieties through the Plant Introduction Service of the U.S. Department of Agriculture be intensified, and the seed be multiplied and selected at the Inter-American Institute of Agricultural Sciences, Turrialba, before distribution. For the evaluation of rust resistance the Institute maintains close contact with Dr. Branquinho d'Oliveira, Director of the Coffee Rust Investigation Center at the Estacão Agronomica Nacional, Oeiras, Portugal.

Roma - Tip. del Senato del dott. Giovanni Bardi

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